

# Field Artillery at the Crossroads of Transformation

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**A**FTER A DEBATE that lasted through the summer of 2002 about the future of the Crusader cannon artillery acquisition project, military planners cancelled the system.<sup>1</sup> They based their decision on arguments that the heavily armored howitzer was not versatile enough to support future operational capabilities needed to fulfill the country's security objectives. The howitzer's many drawbacks included—

- Being too heavy for rapid deployment.
- Being too much of an area fire weapon and lacking precision engagement.
- Not being innovative enough to replace or augment America's current military arsenal.

The cancellation lends credence to a growing trend that sees a mechanized army equipped with heavy weaponry as not having a significant role in countering future conflicts, at least for the U.S. military. Many analysts claim that the United States has such a worldwide military dominance that future defense budgets (currently unmatched by any country or even blocks of countries) should be reassessed and, perhaps, reduced, not just in spending but also in force structure.<sup>2</sup>

Those who advocate progressive increases in defense expenditures point toward the costs associated with military Transformation and achieving overwhelming military dominance, a need exacerbated by the war on terrorism. As President George W. Bush stated in September 2002, "Our forces will be strong enough to dissuade potential adversaries from pursuing a military build-up in hopes of surpassing, or equaling, the power of the United States."<sup>3</sup>

Even within U.S. Armed Forces there is ongoing debate. The discussions, especially between the Air Force and the Army, relate to determining the proper role of ground-based fires in light of continuing ad-

vances in surgical precision bombing; changing and evolving strategy and doctrine; and the extraordinary successes of recent operations like the sea and air campaigns in Kosovo and Operation Desert Storm.<sup>4</sup>

An issue requiring further debate relates to whether the Army should continue to place importance on heavy tanks and cannons. The Crusader's cancellation brought to light the ongoing revolutionary Transformation debate within the Department of Defense (DOD). Army leaders consider ground-based, nonlinear-of-sight, indirect-fires systems as being needed to execute the Army's core competencies, the most central of which is "land dominance across the full range of military operations and spectrum of conflict."<sup>5</sup>

On 22 October 2002, former U.S. Army Chief of Staff General Eric K. Shinseki highlighted three future fighting systems paramount to the Army's ability to maintain continued success:

- The Comanche helicopter.
- The Stryker wheeled combat vehicle.
- The nonlinear-of-sight, indirect-fires artillery system.<sup>6</sup>

The military budget situation also brings a significant problem to the forefront. While the Army tries to recapitalize on and maintain its current force, it must fund deployments and operations as well as the Future Force. The Army will continually face uphill funding battles similar to the one leading up to the fiscal year (FY) 2004 budget, whereby the Army faced a projected \$6.2-billion shortfall.<sup>7</sup>

## Importance of Today's Field Artillery

Military leaders should not dismiss lethal and non-lethal artillery when exercising instruments of military power. Arguably, the best way to destroy artillery is with artillery. Bush's stated Axis of Evil

initially included Iran, Iraq, and Korea. Field artillery systems—platforms for rockets, missiles, or other projectiles—are or were part of those rogue states' military resources. Syria, Libya, China, and Pakistan also have questionable motives and instability as well as sizeable ground-based capabilities.<sup>8</sup> Pragmatic military leaders who recognize such threats will update warfighting tactics to face these challenges.

According to Army interpretations of North Korean offensive doctrine, attacking Korean forces could count on 150 to 180 artillery tubes per 1-kilometer (km) frontage and an inventory totaling 10,400 artillery pieces, which is the highest artillery-to-supported-troops ratio in the world. As a division commander, General Leon LaPorte, Allied Forces, Korea, developed "artillery-based maneuver" as a way to defeat his potential adversary's strong advantage in artillery systems.<sup>9</sup> The concept consists of engaging the enemy decisively with joint fires and following up actions with maneuver forces, even if it means initially slowing ground operations' tempo.

Other threats emanate from rogue states or nonstates having unstructured forces, some equipped with tanks and artillery and using unconventional tactics, as witnessed during Operation Anaconda in Afghanistan. During the first few days of that operation, al-Qaeda terrorists and Taliban forces fired projectiles from D-30 cannons and mortars at U.S. forces, demonstrating that terrorist organizations include artillery instruction in their training programs.<sup>10</sup> Coalition special forces soldiers destroyed at least five enemy howitzers during that operation.

Artillery has inflicted more casualties than any other weapon system on post-19th-century battlefields. More specifically, mortar and artillery shells killed more soldiers during last century's major wars than any other system. Even during the Vietnam war, where North Vietnam lacked extensive artillery, 65 percent of all wounded U.S. forces resulted from artillery or mortar fragmentation.<sup>11</sup>

More recently, field artillery proved its role on the battlefield in the Falklands Campaign and Operations Desert Storm and Iraqi Freedom and in Lebanon, Chechnya, and Afghanistan. During the first two days of Operation Anaconda in Afghanistan, the U.S. Army suffered 36 casualties (28 being caused by enemy mortar fire) in an area that had been repeatedly saturated with intelligence-gathering unmanned aerial vehicles (UAVs) and Air Force bombing before ground forces moved into the area of operations.<sup>12</sup>

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Defense Paul Wolfowitz responded that Army artillery systems, rockets, and howitzers were much more devastating to Iraqi artillery than anything that could have come from the air.<sup>13</sup>

## Ground-Based Fires v. Precision-Guided Munitions

Cannon and rocket artillery is cumbersome to support logistically, but the benefits outweigh the cost. Especially with the Army facing a projected \$135.3-million training-ammunition deficit for FY 2004.<sup>14</sup>

Russia, known for its technological advantages in the area of precision munitions, nevertheless extensively used artillery during the second Chechnya War. Seventy to 90 percent of indirect fires the Russians employed against terrorist targets were from ground-based artillery.<sup>15</sup>

Precision projectiles and bombs are expensive. One particular developmental artillery precision round, the 155-millimeter (mm) Excalibur projectile, will cost \$36,000 or more. Designed for current and future cannon systems, the round can impact within 3 to 9 meters of a target at extended ranges.<sup>16</sup> On the other hand, cannon projectile packages are cheaper and seem easier to mass-produce. Cannon projectile packages costs from \$400 to \$1,200 versus nearly \$7,000 for a wartime rocket fired from the M270/M270A1 multiple-launch rocket system (MLRS). A joint direct attack munitions (JDAM) kit, minus the cost of the bomb, costs approximately \$18,000. A JDAM kit smartens dumb bombs by using a Global Positioning System guidance system.<sup>17</sup> Hence, cannons and mortars are part of the upper end of the arsenal of choice for most rogue, technologically deprived states and terrorist organizations, especially those that can ill-afford expensive precision weapons and air- or sea-based shooting platforms.

The U.S. military's focus has shifted toward the perceived need for more mobile, lighter systems that can fire munitions more precisely while maintaining lethality. Precision munitions, mostly fired from air- or sea-based platforms, accounted for 7 percent of all ordnance expended during Operation Desert

Storm. The percentage rose to 30 during air operations against Serbia and to 65 in recent action against Taliban and terrorist forces in Afghanistan.<sup>18</sup>

The U.S. military should consider air-delivered precision bombing methods an option—not a replacement. Requirements for massed and suppressive lethal and nonlethal fires even during Phase IV

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operations will continue because there are many reasons for maintaining a redundant, complementary, ground-based fires capability.

Although the 7-week-long air campaign during Operation Desert Storm proved tremendously successful, it did not meet General Norman Schwarzkopf's battle damage criterion of destroying at least 50 percent of Iraqi ground forces as the precondition for a ground campaign.<sup>19</sup> In 1999, an assessment team, which went into Kosovo immediately after the air campaign ended, found only 52 damaged or destroyed vehicles—a 6 to 1 disparity between battle damage actually found and what NATO estimated during combat operations (320 vehicles).<sup>20</sup>

Strategic-level targets seem to be the Air Force's preferred targets of choice. Operational- and tactical-level targets seem to be less preferred because of the increased air defense threat, fluid battlefield conditions compounded by weather conditions, and the difficulty associated with massing air assets.<sup>21</sup>

With the ongoing war on global terrorism, conducting an air- and sea-only campaign is unlikely. Political leaders are opting for solutions that require a proper mixture of joint air, sea, and ground options. The military's reluctance to use ground forces (which partly stemmed from events in Mogadishu, Somalia) seems overcome by the events of 11 September 2001.<sup>22</sup>

During Operation Iraqi Freedom, artillery proved pivotal. On 25 March 2003, heavy sandstorms grounded supporting aircraft while artillery provided fire support for Marines during heavy fighting around Nasiriya. In the northern Kurdish area of Iraq, Iraqi troops initially sought protection from allied air attacks when vapor trails from U.S. aircraft gave them

warning. An unexpected bombardment from two howitzers of the 173d Airborne Brigade proved key to breaking the will of the entrenched Iraqi soldiers.<sup>23</sup>

As weapon munitions become more sophisticated, targets might not necessarily become easier to destroy, if for no other reason than measures humans take to survive. Those who have the will to survive or who are in a blinding rage of hate will find ways to defeat U.S. technology.

Munitions designed to destroy pinpoint objects, especially ordinance fired from high altitudes, will not necessarily achieve desired effects if used against—

- Terrorists or soldiers maneuvering in sport utility vehicles or pickup trucks.

- Decoys.

- Forces protected in covered and concealed positions, such as Taliban forces who covered themselves with blankets to mask themselves from UAVs during Operation Enduring Freedom.<sup>24</sup>

- Individuals concealed in forested or rocky hilltops armed with relatively inexpensive nonradar-emitting, hand-held, surface-to-air missiles or less sophisticated weapons capable of damaging or destroying multimillion-dollar, manned attack air, airlift, or helicopter systems.

Current doctrine calls for responding appropriately to detected targets. If operators accurately locate a stationary, time-sensitive, high-payoff target, then response measures should include using precision bombs that can effectively destroy the target while minimizing collateral damage and risk to soldiers and aviators.

Often, however, targeted objects will not cooperate in accordance with attack guidance parameters. Fire-delivery assets might not be available, and detection means might create too large a target location error (TLE) for successful delivery execution. Forces might then need to use area suppression options as an engagement method. Randomly impacting shells might not necessarily destroy an intended target, but if the enemy is rattled and decides not to pull a trigger or launch a missile, then the desired effect is achieved.

Employing area fire weapons requires careful consideration because of the effects of collateral damage. Waging a war or enforcing the peace while operating under an ambiguous set of rules can lead to devastating results. One only has to review instances in Lebanon where faction militia, firing indirect systems from populated areas, faced no serious retribution from Marine artillery positions. Prior to the signing of the Dayton Accords in 1995, requests for fire to support UNPROFOR in Bosnia

Snow splashes from the trails of a 155-mm howitzer as it pounds Chinese positions during a February 1952 storm. Said General Matthew B. Ridgway when speaking before the JCS, "Whatever may have been the impression of our operations in Korea to date, artillery has been and remains the great killer of Communists. It remains the great saver of soldiers, American and Allied. There is a direct relation between the piles of shells in the ammunition supply points and the piles of corpses in the graves registration collection points."

US Army


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were often curtailed or cancelled, in part because Bosnian entity factions had learned how best to avoid punitive action, such as by holding peacekeepers as hostages. Another example of the effects of having restrictive rules of engagement (ROE) occurred in Mogadishu. Having little heavy weaponry and no tank support, U.S. Rangers suffered severe casualties while trying to rescue downed helicopter crewmen.<sup>25</sup> In these cases, constraining mandates and ROE kept the military from employing all possible methods and weapons, even for use as a show of force, which resulted in unnecessary losses.

Opportunities exist to improve the accuracy of artillery at reasonable expense. Low-cost competent munitions (LCCM) are being developed that will increase artillery accuracy by 50 percent by using range-correction guidance and control systems attached to the artillery projectile. These attachments, which could feasibly cost \$3,000 each, along with fuses would allow target-destruction criteria to be met and would minimize collateral damage.<sup>26</sup>

Because MLRS rocket ammunition, including reduced-range training rockets, is expensive, training units fire a fraction of the number of rockets per year than they would fire during actual combat. However, cannon units fire many more projectiles, which allows them to hone their skills and put their systems under near-real combat stress situations.

Artillery's reputation is that it can achieve effects on target only when firing large volumes of fire. Even Wolfowitz has said that it takes over 100 artillery rounds to destroy a target.<sup>27</sup> Unfortunately, the Army also has this perception. Tests prove artillery can cause damage against tanks with far fewer projectiles than what is listed on unclassified training-effects tables. Combined with accurate target location and updated firing data, and taking into account other elements involved in executing fire missions, artillery rounds after adjustment can accurately impact within 50 meters of a target location. Those impacting within 30 meters of a target have the same desired effects as a direct hit.<sup>28</sup>



A light armored reconnaissance battalion of the 1st Marine Division pushes north during a sandstorm in Iraq, 26 March 2003.

USMC

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Unfortunately, artillery fire cannot be replicated in its truest form at the combat training centers. Also, current computer exercise databases have questionable built-in battle damage assessment (BDA) software. If artillery BDA effects were more accurately portrayed during training, maneuver forces would quickly assume secondary roles, with artillery assuming a dominant one. Balancing artillery effects could cause consternation, however, since costly training-center rotations tend to focus on decisive ground-maneuver operations.

### Ground-Based Fires Shortfall

The Army's ground-based fires shortfall is causing risk to maneuver forces. Compared to the rest of the world, the United States lags in artillery capabilities.<sup>29</sup> Short of having a missile defense-type system, which could protect soldiers from incoming shells, the only assured, timely way to destroy incoming artillery projectiles is with other artillery systems (missiles, rockets, or projectiles).

The Army can best detect and destroy effective artillery, especially towed artillery systems that are

harder to displace, by using a mixture of artillery, rockets, and air assets directly linked to counterfire radars. Unfortunately, this reactive way of engaging the enemy adds risk to ground forces. Fires are complementary, with the following making up the family of fires:

- Close air support (CAS).
- Army aviation, mortars, and electronic warfare.
- Cannon and rocket systems.

Many competing events make the artillery component the primary, around-the-clock capability available to engaged ground-component commanders. Such events include—

- Weather and terrain factors.
- Target-range considerations.
- Limitations from Air Force asset apportionment and allocation.
- Attack-guidance prioritization.

The North Koreans have longer-range artillery than the United States has. One particularly alarming North Korean artillery gun is the domestically produced 170-mm Kochsan, which has even been exported to Iran. Before the 2003 war in Iraq, the

Iraqi military had developed a 400-mm MLRS, an improved free-rocket-over-ground system with a 90-km range, and 1,900 towed artillery pieces. Iran also has a sizeable artillery arsenal, including a domestically built rocket system with a 140-km range.<sup>30</sup> Other countries possess cannons equal in performance or superior in capabilities to the U.S. Paladin howitzer.

The U.S. Army is still accepting risks, although those risks are somewhat offset by superior counterfire capabilities. Still, China, the Slovak Republic, France, Germany, Israel, Russia, South Africa, and the United Kingdom have artillery systems equal to or more capable (range, rates of fire) than the Paladin has.<sup>31</sup> Some less-developed states have even ingeniously updated antiquated systems. Once developed, even advanced artillery systems are relatively cheap to mass-produce, and they proliferate around the world.

If U.S. soldiers encounter impacting artillery—even from less-capable weapons systems—lives are at risk. During Operation Anaconda in Afghanistan, soldiers from the 10th Mountain Division waited from 26 minutes to several hours to receive air support. This would have been all right if they had not been fired on and if targets had not been “fleeting.” However, al-Qaeda forces were firing mortars at them without repercussions and did so through rudimentary aiming and survival techniques. The result caused mission delays and injuries to U.S. soldiers.<sup>32</sup> If U.S. forces had employed counterfire radar (AN-TPQ-36) linked to artillery or mortars they could have likely eliminated the terrorist mortar threat within minutes. Artillery was later brought into the theater of operations as part of a follow-on replacement force.<sup>33</sup>

During its war with Iran, which lasted throughout the 1980s, Iraq inflicted hundreds of thousands of casualties while maintaining its ground in spite of a threefold disadvantage in troop strength. They achieved success primarily through this artillery ad-

vantage over the Iranians. Iraqi gunners fired up to a half million shells a month during that war. So why were the Iraqis so soundly beaten in 1991 if they had such a formidable force?

By 1991, U.S. forces were better trained, fresher, and capable of massing available joint fires. They

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decimated Iraqi artillery through an effective, deadly counterfire fight that was so devastating that one Iraqi commander said that he went from 90 percent artillery strength to zero.

Other reasons Iraqi artillery failed miserably in 1991 included the following:

- Coalition forces faced antiquated Soviet-style systems.
- Commanding, controlling, and logistically supporting the many different types of artillery in the Iraqi Army proved to be a challenge, as it would be for any army.

□ Leadership challenges occurred because many officers were the first to flee their units.

□ Most artillery was towed and some was dug in, immobile, and stationary, which caused them to become easier-to-hit targets.<sup>34</sup>

One of the greatest threats to a ground force comes when it moves through canalizing terrain or when it maneuvers through other types of barriers. During the initial stages of ground operations in 1991, the U.S. 1st Infantry Division conducted successful barrier-breaching operations while firing 6,000 cannon rounds plus MLRS rockets in support of that combat event. Even as the Army prepared in 2002 for the follow-on Iraqi campaign in 2003, U.S. ground troops at Fort Hood, Texas, concentrated rehearsal efforts on executing risky breaching operations, partly out of fear of Iraqi artillery.<sup>35</sup>

## Transformation and Field Artillery

Field artillery is designed to provide responsive, continuously available fires in support of the maneuver commander. These fires help “weig[h] the main effort and shap[e] [the] battle space.”<sup>36</sup> Army combat structure is based on each brigade being equipped with a direct-support (DS) cannon battalion, with

Country	Maximum Projectile Range (km)	Sustained Rate of Fire per Minute
Germany Pz H2000 155mm	40	10
China PLZ 45 155mm	39	4-5
Type 59 130mm	27.2	5-6
WM 80 MRL (rocket)	80	
USA Paladin M109 155mm	30	4
Russia 2S19 152mm	40	8
Iran Thunder-2	30	5
GHN 45 155mm	39.6	7
Lybia Palmaria 155mm	30	4
Type 59 130mm	27.2	5-6
N. Korea M1992 130mm	29.5	NK
Kochsan 170mm	NK	NK
UK AS90 155mm	40	6

Countries that possess cannon equal or superior to the U.S. Paladin.

Air liaison officers with the 3d Infantry Division in Iraq (a mature theater) generally received a quick response, but 10th Mountain Division soldiers in Afghanistan waited from 26 minutes to several hours to receive air support against "fleeting" targets.



US Army

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additional reinforcing artillery battalions organized into separate brigades at corps level. The Stryker Brigade Combat Team (SBCT) and the ongoing reconfiguration of the 101st Air Assault Division and the 3d Infantry Division are the focus of Army Transformation.

The SBCT is the Army's answer to bridging the gap that exists between the insertion of initial airborne and air assault forces and the follow-on deployment of heavier counterattacking units. As a result, the Army is feverishly trying to outfit these brigades as quickly as possible. The SBCTs are to be deployed in toto within a 96-hour period. However, they are not to be mistaken as stand-alone forces.

One drawback to an SBCT is that it sacrifices sufficient indirect-fires capabilities to remain as deployable as possible. The SBCT relies heavily on air support for supporting fires and mortars. Deployment requirements originally limited its artillery to 12 tubes of 155-mm towed howitzers, which are inadequate to accomplish the indirect-fires requirements covering the breadth of the brigade's ever-expanding areas of responsibility (AOR). An AOR can encompass 50- to 100-square kilometers, depend-

ing on the type of operation and level of hostility.

Realizing the need for greater lethality, there is now a plus up from 12 to 18 cannons for the SBCTs. Even so, the SBCT will require reinforcing fires from follow-on forces, such as the counterattack corps, in scenarios involving increasing combat intensity.<sup>37</sup>

The Current Force structure, which includes M1A1 tanks, M109A6 howitzers, M2A2 infantry fighting helicopters, and AH-64D attack helicopters, should continue to be a part of the Army's force structure. Arguably, heavy forces should remain permanent fixtures of the Army's force structure, perhaps even as part of the Future Force.<sup>38</sup>

At \$11.5 billion covering the lifetime of the project, which included the purchase of 420 systems, the cost of the entire Crusader howitzer project would have been a small portion of the defense budget (roughly 3 percent of the FY 2004 budget).<sup>39</sup> Although Secretary of Defense Donald H. Rumsfeld has stated that terminating the Crusader cannon would release funds and speed up research, its cancellation means that the Army must retain the Paladin howitzer at least through 2028, which extends the average shelf life for the Army's M109-model howitzer. By the

time it can be replaced, it will be 70 years old.<sup>40</sup>

The M109A6 Paladin, which has been totally rebuilt, is an excellent, proven system, but it still lacks the capabilities of much of the world's current artillery.<sup>41</sup> The Paladin, is a legacy from the original 1963 mode, and is much better than its A2/A3-series predecessor. But soldiers must still load the cannon by hand, which affects rates of fire. Much as artillerymen have done since the American Civil War, cannoneers must still manually—

- Fuse and load the approximately 95-pound projectiles into the Paladin's breech.

- Cut and load the charges by hand.

- Fire the round by igniting a primer using a lanyard to facilitate the firing action.<sup>42</sup>

The modernized, digitized counter-attack corps, known as the Army's "strategic hedge," is a heavy mechanized force consisting of several divisions and a mechanized cavalry regiment.<sup>43</sup> The 3d Armored Corps, Fort Hood, Texas, is the primary ground component and, supposedly, will be maintained for the mission to reinforce initial-entry forces during major conflicts. As part of that corps, heavy mechanized brigades will deploy as follow-on forces within 30 days, perhaps even sooner if they use pre-positioned equipment and if the Army, with the Navy, fully fields adequate numbers of fast, catamaran-type ships known as theater support vehicles, which can carry a company of Stryker vehicles at speeds up to 46 miles per hour.<sup>44</sup>

Since Operation Desert Storm, significant force reductions have occurred within heavy maneuver combat brigades. The Army downsized from 18 to 10 active divisions. Within these divisional organizations under Force XXI restructuring, combat-system reductions occurred at practically all levels. Each battalion of 58 tanks or infantry fighting vehicles, respectively, deactivated 14 systems per battalion, resulting in a net loss of 25 percent trigger-pulling combat power throughout the brigade. The cannon battalion was reduced from 24 M109A2/A3-series to 18 Paladin howitzers as an interim alignment, realizing that the delta periods between the realignment and fielding of recapitalized or future force equip-

Soldiers of the 82d Airborne Division fire 120-mm mortars during operations in Afghanistan's Baghni Valley, March 2003.



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ment were calculated periods of risk.<sup>45</sup>

The only gain to the brigade during this period was an engineer battalion, which is considered a combat multiplier, not an actual trigger-pulling element, on the brigade combat team. Division commanders have only one attack aviation battalion that consists of 24 Apache attack helicopters, which are reserved for the division commander's deep and close fights and have little opportunity to directly support brigade commanders. Previously, division commanders had two battalions with a total of 36 helicopters.

Risks associated with having fewer helicopters are only now being balanced as the Army fields the recapitalized AH-64D Apache Longbow. Upping the number of M270 MLRS to 18 systems in a division (up from 9) comes with a cost. MLRS battalions at Corps, having the primary mission of counterfire against opposing forces' artillery and suppression of enemy air defenses, have been downsized from 27 launchers to 18 per battalion. Only recently have the battalions been upgraded to the recapitalized M270A1 MLRS.

Within the artillery community, there is debate over whether MLRS rockets are a better alternative to cannon fires. Again, rockets and cannon projectiles present a complementary mix to the family



of fires. However, rocket platforms face serious challenges. In many mission scenarios, especially in the Korean-terrain scenario, the highly technical,

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digitized MLRS launcher proves less effective than cannon systems. Some challenges associated with launchers include—

- ▢ An inability to operate in a degraded operating mode.
- ▢ Emplacement limitations caused by terrain characteristics.
- ▢ Mission-cycle processing times.
- ▢ Hardware and software maintenance problems.
- ▢ Minimum rocket range requirements.
- ▢ Time and procedures associated with reloading rockets and missiles.

Nevertheless, MLRS—a necessity in facing future challenges—is essential in performing counterfire missions; rocket or missile deep-interdiction killing fires; and suppressive strikes against air defense systems.<sup>46</sup>

Army attack aviation and tactical air support, which the Navy and Air Force provide, are imperative for mission accomplishment, operational successes, and to win wars. But there are challenges when operating in a combined and joint environment. Army aviation and CAS are not always responsive, and formalized air tasking orders (ATO) might not necessarily be flexible enough.<sup>47</sup>

Immediate air support is possible when executing an ATO, but what the Air Force considers immediate might not be quick enough to support engaged combat troops. In all cases involving air assets, air allocation and weather dictate air support responsiveness and accuracy. Also, planes need airfields, overflight permissions, maintenance facilities, fuel, and other supplies.

Many in the Army believe the ground commander has an indirect-fires requirement that must be responsive and effective under all weather conditions, regardless of the environment.<sup>48</sup> The Marines face a similar problem, compounded by the fact that they have no rocket system in their inventory.

When Marine Corps Commander General James L. Jones, European Command, was a division commander he had to over-rely on availability of aviation or Army rocket assets because he simply did not have the artillery he needed to support his operations.<sup>49</sup>

Army battalions have mortars, but mechanized battalions are limited to four tubes. Mortars are increasing in lethality, responsiveness, accuracy, and range. Operations in Afghanistan proved the necessity for the larger 120-mm mortar, and some lighter forces are augmented with the longer ranging system. Mortars are doctrinally designed to be organic to smaller combat organizations such as company- and battalion-size units.<sup>50</sup>

Higher echelon forces at brigade require artillery for direct supporting fires. Artillery is organized into a DS field artillery battalion that often cannot meet delivery requirements because of competing fires tasks. Fires tasks for a DS artillery battalion that might require simultaneous execution include—

- ▢ Reactive counterfire missions against enemy artillery systems, including countermortar fire.
- ▢ Suppression of enemy air defense.
- ▢ Obscuration and screening smoke used for deceptive or force-protection measures, especially during canalizing river-crossing operations.
- ▢ Illumination at night or when using a daytime marking round.
- ▢ Emplacement of hastily delivered, self-destruct minefields.
- ▢ Limited precision fires with Copperhead.
- ▢ Massed killing fires, using dual-purpose, anti-vehicular or antipersonnel munitions or high explosive munitions.<sup>51</sup>

On a more positive note, LCCMs and a precision-guided, cannon-fired round called the Excalibur make up for the shortcomings of ground-based precision ammunition. Advanced developments are also in place for mortar systems, including a precision mortar projectile.<sup>52</sup> More advanced artillery smoke rounds now provide better and longer lasting battlefield obscuration and screening effects while expending less ammunition than did previous smoke-round types. Illumination projectiles have proven their worth during peace and stability operations in Kosovo, where even coalition partners have requested “Bright Skies” illuminating fires in support of counter cross-border smuggling operations. The Kosovo mission often requires some risk since Paladin cannons must often deploy outside the security of base camps in order to range border areas.



*Rockets and cannon projectiles present a complementary mix to the family of fires. However, rocket platforms face serious challenges. In many mission scenarios, especially in the Korean-terrain scenario, the highly technical, digitized MLRS launcher proves less effective than cannon systems.*

## Fixing the Problem

How then do we fix our artillery woes? One clear, viable option is to continue accepting risk in the area of ground-based fires. Balancing risk to support cost-cutting measures is risky but viable. Canceling the Crusader is a sign of such a policy.<sup>53</sup> Deciding to cancel the Crusader, against the wishes of Army leaders, shows that DOD is willing to assume some level of risk during the period 2008-2028.

Terminating the Crusader project saved billions of future dollars. Some of those funds are now being invested into better artillery rounds, precision-guided rockets, or other futuristic combat systems.<sup>54</sup> Decisionmakers probably assumed that by 2008 the Axis of Evil will no longer pose a threat to national security.

Of course, fires will still be available to support the ground commander and will probably continue to include cannon, mortars, rockets, missiles, army attack aviation, and CAS. And, fires normally assigned to higher echelons at Corps could also provide reinforcing fire support to the maneuver commander, which would enhance the ground commander's capabilities. Also, the Army is transferring technology gained from the Crusader project and placing it into the Army's next nonlinear-of-sight system, to be fielded in FY 2008.

The Army and the Marines are proceeding to procure artillery while anticipating the future fielding of a wheeled, high-mobility, artillery rocket system and the lighter weight M777 155-mm towed howitzer. So, although the Crusader project is cancelled, there are other, comparatively low-cost modernization and ongoing procurement programs, including the AN/TPQ-47 improved counterfire radar, the M270A1 MLRS recapitalization program, and improvements to mortar systems and ammunition.<sup>55</sup>

Another possible solution to enhance mechanized artillery capabilities is to upgrade the Paladin (at an original cost of \$1.6 million) while the U.S. continues to design another system. Increasing the caliber of the Paladin and installing an automatic loader would perhaps make up for current shortfalls. However, the Army has long considered the Paladin as only an interim system and had no original intent of upgrading it. If the intent had been to eventually upgrade the Paladin, the British would have seriously opted for acquiring it instead of continuing with its separate AS90 howitzer project. Also, trying to make necessary upgrades might exceed the capacity of an M109 cannon model.<sup>56</sup>

The Army could also consider augmenting its current artillery organizational structure. Instead of assigning battalions to like units (MLRS-pure and



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***Purchasing or leasing superior howitzers from the Germans, French, or British and to augment or replace the Paladin would be a cost-effective, risk-adverse way to solve short-term artillery problems. Those howitzers would greatly assist U.S. forces facing counterfire threats in a future conflict. At \$8 million a system (\$2 million less than the Crusader), the German PzH2000 self-propelled howitzer would seem to be the better option.***

Paladin-pure systems), the Army could include an MLRS battery as a fourth firing unit to a DS cannon battalion as part of a permanent organic command and control (C2) structure. Arguably, doing so might cause greater C2 and logistical problems, but with increased digitization capabilities and proper realignment from existing units, the option would be viable and would become a necessity, especially if the Army realigns artillery assets at corps level. Cannons could continue the close supporting role, while the MLRS battery could share in other responsibilities and tasks, like counterfire operations.

All current rocket fires augmentation to a brigade is in the form of a supporting relationship and for temporary periods. Direct support battalion commanders, having command authority over an MLRS battery and making that unit a habitual part of the brigade combat team, might be able to improve fires responsiveness; increase awareness of rocket capabilities; enhance brigade combat-readiness levels and lethality; and most important, provide more resources to the commander in order to support operations.

Another option is to purchase or lease systems that allies have already developed and fielded and pre-position those systems afloat or nearer to volatile areas. (Of course, doing this might prove to be too large of a political obstacle to hurdle.) Procured at reduced levels, co-manufacturing foreign cannons in the United States or leasing them are options that might dampen political and public reaction and tend to mirror some of the ways NATO allies are acquiring foreign-developed artillery.<sup>57</sup>

Leasing howitzers, at least until the Axis of Evil no longer remains a threat, would provide a more immediate solution. Certainly, immediately purchasing or leasing superior howitzers from the Germans, French, or British and to augment or replace the Paladin would be a cost-effective, risk-adverse way to solve short-term artillery problems. Those howitzers would greatly assist U.S. forces facing counterfire threats in a future conflict. At \$8 million a system (\$2 million less than the Crusader), the German PzH2000 self-propelled howitzer would

seem to be the better option.<sup>58</sup>

The German heavy mechanized cannon comes close to Crusader capabilities but would still require some modification to accommodate U.S. logistical and C2 parameters. The military would need a maintenance agreement with howitzer and ammunition manufacturers that would allow American independence to develop its own repair parts and ammunition so the acquisition could not be used as political leverage. Also, linking a lease program to combined allied efforts in Transformation might help the Army overcome some budgetary shortfalls and increase the political clout needed in future budget debates concerning Future Force procurements.

Bringing allies on board with Transformation projects, including having them help fund future developments, might prove advantageous to the Army and to taxpayers and would seem to be within the spirit of mandated foreign comparative-testing procedures.<sup>59</sup> Leasing the PzH 2000 would at least make artillery systems within some NATO countries more interoperable, because countries like Greece, Italy, and the Netherlands have or are



***Although Secretary of Defense Rumsfeld has stated that terminating the Crusader cannon would release funds and speed up research, its cancellation means that the Army must retain the Paladin howitzer at least through 2028, which extends the average shelf life for the Army's M109-model howitzer. By the time it can be replaced, it will be 70 years old.***

adopting the German howitzer.<sup>60</sup>

There are also ways future fires systems could hurdle the weight dilemma to allow for air transportability, such as by not focusing the end product as a unitary item. Building or recapitalizing cannons or launchers into sectional pieces would make them more transportable. Assembly or disassembly could be done through DS maintenance capabilities. For instance, a C160 Transall can transport the German-built MLRS because its launcher-loader module can be assembled and disassembled. Both items can be transported together or separately. Altering the way we transport Army equipment could require fewer planes to transport more major end items.

The military is still developing NetFires (rockets in a box), touted as a future nonlinear-of-sight system. This light, 2- to 50-km rocket range, precision-based, one hit—one kill system is similar to a pod of MLRS rockets, but it is more advanced in capabilities, mounts vertically on a trailer, and fires remotely.<sup>61</sup> Such a system will probably not provide all of a ground commander's suppressive requirements, but it would surely complement capabilities.

Other innovative ideas under development, and in some cases in cooperation with allies, include a precision-guided MLRS rocket, a precision-guided mortar round, cheaper LCCM alternatives, and the Excalibur 155-mm round.<sup>62</sup> However, it seems premature to comment on NetFires or other developmental projects until they have proven their worth.

Plus, the cost for these newer systems has yet to be determined. As recent as August 2002, it was reported that costs associated with fielding a Crusader replacement would increase from \$18 to \$24 billion over the \$11 billion Crusader project, and delivery time would also increase.<sup>63</sup>

Another solution that should be carefully analyzed is the way the military plans, controls, and executes indirect fires. Planning and executing fires are post-graduate-level military art requiring detailed cross-branch and service coordination, planning, and rehearsals and timely execution and accurate targeting to achieve intended results. The military should also re-look ATO procedures and allow for a more streamlined system. The Army and Air Force must continue to train on timely clearance and simultaneous execution of joint air and ground-based fires, including training all Army field artillery observers at the Air Force Air-Ground Operations School.<sup>64</sup>

Within the Army, for a number of reasons, ground-based fires are repeatedly not executed to standard as reported by observer/controllers at combat training centers. There is a lack of proper observer training, improper walk-through rehearsals, TLEs, battlefield confusion, and a lack of streamlined communications procedures. Fixing training-related issues must remain a priority.<sup>65</sup>

The Army should also expand its investments into everyday practical venues of C2 systems. Realizing that nonverbal digital communications facilitate

fires within the artillery community, the Army still has not addressed problems associated with the clearance and prioritization of execution of fires.

Executing fires digitally does not provide the ground commander at brigade level and below with adequate awareness of the employment of fires. Perhaps establishing a more network-centric "911" system of calling for fires into a centralized location by way of tactical cell phones is possible. A simple pocket-size, message-scambling cell phone, equipped with immediate conference calling, might actually prove to be a pragmatic communications means—one that would complement the digitization

process and shorten the time it takes to process calls for fire.

Myriad ways exist to improve the current ground-fires situation to negate risks to ground forces in a financially sound manner. By accepting the premise that ground forces are ultimately responsible for accomplishing military missions regardless of the mission scenario, the military should do what it can to minimize risks to the ground maneuver soldier. Maintaining redundant, complementary, joint, interoperable combined fires capabilities allows military leaders to execute the will of political policymakers, especially as America and its allies continue to face unknown, spiraling future threats. *MR*

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